ARIZONA DEPARTMENT OF WATER RESOURCES
OFFICE OF WATER ENGINEERING
500 North Third Street,
Phoenix, Arizona 85004
602-417-2445

DAM SAFETY
EMERGENCY ACTION PLAN FORM

Arizona Administrative Code (A.A.C. R12-15-1221) requires each owner of a jurisdictional dam classified as significant or high hazard potential to prepare an Emergency Action Plan (EAP). These plans must be prepared, maintained, and exercised for immediate defensive action to prevent or minimize property damage, injury, or loss of life due to an emergency-flooding situation.

Attached is a simplified form for development of an EAP. This form is made available to all dam owners in the State of Arizona. This form is provided to assist the dam owner in preparing an EAP complying with State requirements and Federal Emergency Management Agency guidelines presented in FEMA 64, "Federal Guidelines for Dam Safety: Emergency Action Planning for Dam Owners".

The dam owner must assess whether the attached form is sufficient for the site-specific conditions associated with each dam, or whether additional information must be incorporated to prepare an appropriate EAP. Inundation maps may be developed using common sense in relatively straightforward instances, whereas other more complex flooding situations may require a dam break analysis by a qualified professional engineer. The attached form is most likely to be sufficient for smaller, rural dams.

In order to prepare an EAP, the dam owner should contact the County Sheriff, who is usually the local entity primarily responsible for emergency management. The Sheriff will determine which local agencies and entities should participate in preparation and approval of the final EAP. The owner should coordinate preparation of the EAP and obtain approval by the local emergency management entities. A draft copy of the EAP should be sent to the Dam Safety Program of the Arizona Department of Water Resources (ADWR) for review and approval.

It is the responsibility of the dam owner and local emergency management entities to see that the EAP is periodically updated and exercised so that it may be effectively implemented if an emergency situation occurs at the dam.

If there are any questions regarding preparation of an EAP for a specific dam or suggested revisions to this form, please contact the ADWR Dam Safety engineer responsible for the dam at (602) 417-2445.

DO NOT INCLUDE THIS PAGE WITH THE FINAL EMERGENCY ACTION PLAN

DAM SAFETY

EMERGENCY ACTION PLAN

Dam Name: _____

AZ Dam Number: _____

Location: _____
(Town, County, & Stream)

Owner: _____

Revision Date: _____

PLAN IMPLEMENTATION

The purpose of this Emergency Action Plan (EAP) plan is to prepare for immediate defensive action in order to prevent or minimize property damage, injury, or loss of life due to an emergency flooding situation.

The Owner or his representative who is responsible for "day-to-day" monitoring of the dam to detect adverse or unusual conditions is identified by name in Section 3.1.1. When this person observes any adverse or unusual conditions at the dam, he will notify the owner.

When the owner determines that an adverse or unusual condition constitutes an **EMERGENCY SITUATION**, the owner will implement this EAP by referring to **EAP IMPLEMENTATION FLOWCHART (Figure I),** and **EAP NOTIFICATION LIST (Figure II)**. These figures include information directing the user to the appropriate sections of the EAP for each sequential step required as part of the EAP implementation.

The inundation maps included in this EAP are used by local emergency management entities to define areas requiring evacuation of the affected public when the emergency situation threatens potential loss of life.

Effective implementation of this EAP requires that all participating emergency management entities be thoroughly familiar with the entire plan.

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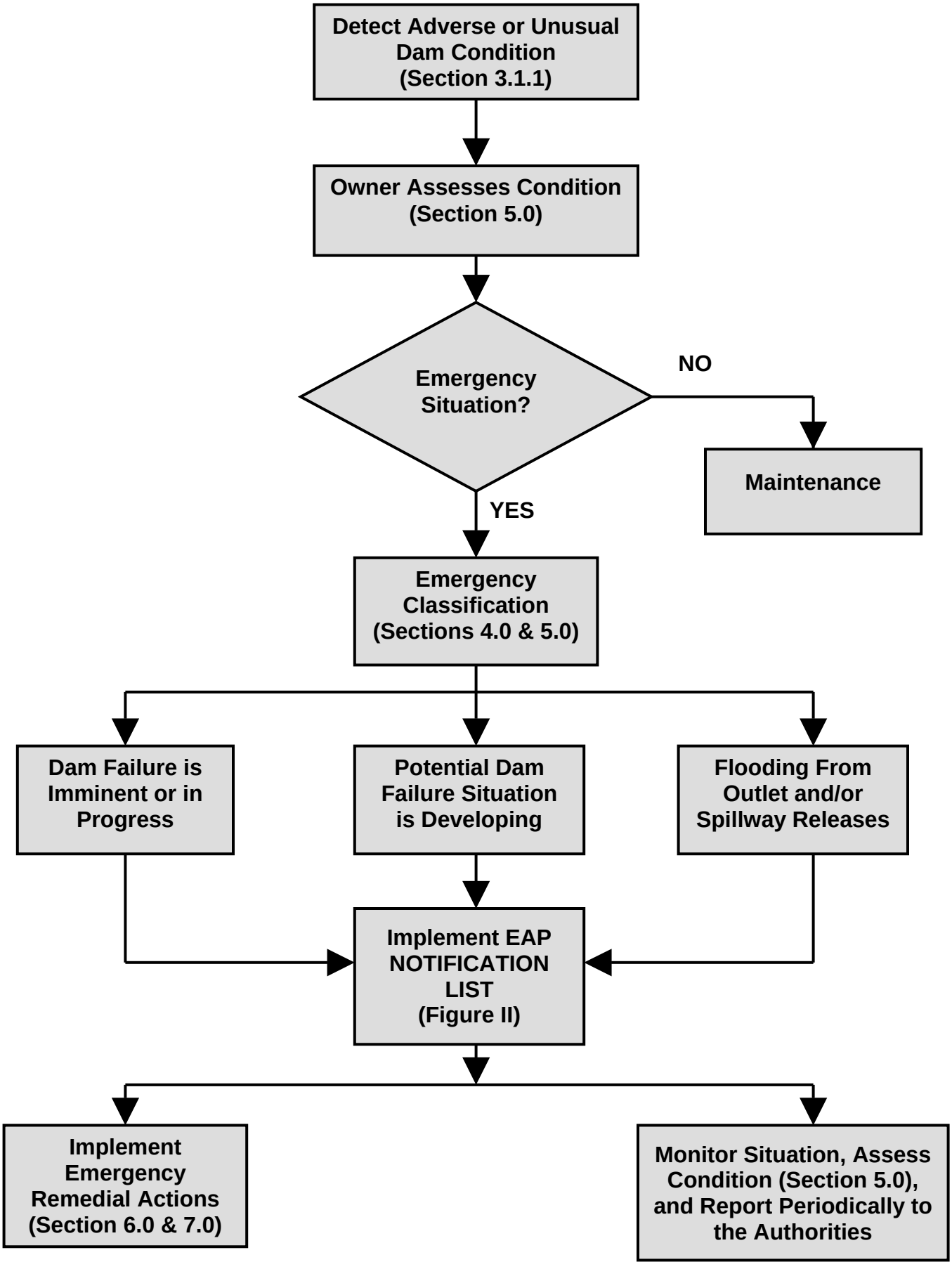
KEY ELEMENTS OF PLAN

FIGURE I - EAP IMPLEMENTATION FLOWCHART



ADWR Revision October 24, 2003

(x): Indicates call priority

FIGURE II - EAP NOTIFICATION FLOWCHART

When **DAM FAILURE IS IMMINENT OR IN PROGRESS** these persons located immediately downstream of the dam where available warning time is very limited are contacted directly for evacuation.

Name	Address	Telephone

Indicate if additional list is attached: _____

OBSERVER: Upon noticing an adverse or unusual condition occurring at the dam, notify the dam owner, operator, or designee immediately

Owner/Operator	Name	Position	Telephone Number
Primary			Day: Night:
Alternate			Day: Night:

The Owner/Operator is responsible to classify the emergency (Sections 4 & 5) and immediately notify the following of the classification, severity, and urgency of the emergency situation.

ADWR Dam Safety and other technical advisors

Name	Position	Telephone Number
J. Darrell Jordan	ADWR Manager	Day: (602) 417-2445 Night: (480) 986-0899
	ADWR Engineer	Day: (602) 417-2445 Night:

(2)

(5)

(1)

(1)

(3)

(4)

County Emergency Management Coordinator(s)	Telephone Number
	Day: Night:
	Day: Night:

Law Enforcement Agency(s)	Telephone Number

Law enforcement (i.e. County Sheriff or Municipal Police) mobilize local emergency service entities and evacuate affected persons.

Designated person to coordinate and implement emergency actions at the dam (Sections 6 & 7)

Name	
Position	
Telephone Number	Day: Night:

Designated person to monitor and assess dam condition (Section 5) and provide updated reports to Law Enforcement

Name	
Position	
Telephone Number	Day: Night:

( )

( )

( )

( )

Highway Patrol (DPS)	
Telephone Number	

County Flood Control District(s)	Telephone Number

Fire Department(s)	Telephone Number

County Road Department(s)	Telephone Number

( )

( )

( )

( )

ADOT Duty Officer	
Telephone Number	

National Weather Service	
Telephone Number	

Local Radio Station(s)	Telephone Number

Local Television Station(s)	Telephone Number

1.0 INTRODUCTION

This Emergency Action Plan (EAP) defines responsibilities and procedures and provides information designed to:

- Aid the owner in identifying adverse and unusual dam conditions that constitute an emergency situation, which could cause property damage, injury, or loss of life.

- Aid the owner in immediately notifying the County Sheriff(s) of an emergency situation so the Sheriff(s) may alert other emergency service entities and, when necessary, implement evacuation of downstream residents from areas flooded by failure of the dam or large operational outlet and spillway releases.

- Aid the owner in identifying and notifying any persons located immediately downstream of the dam when immediate evacuation appears necessary and available warning time is very limited.

- Aid the owner in immediately notifying the Arizona Department of Water Resources, Office of Water Engineering (ADWR), and any appropriate technical advisors.

- Aid the owner in immediately coordinating and implementing appropriate emergency remedial actions, which will not impair the safety of the dam to prevent or minimize the downstream impacts of a dam failure.

- Identify for the owner which types of emergency remedial actions will impair the safety of the dam, and clarify that these actions shall not be implemented except as part of a plan which has been approved by ADWR.

- Aid the owner in monitoring the emergency situation and periodically reporting real-time conditions to County Sheriff(s) for updating other emergency service agencies and organizations.

2.0 DAM AND RESERVOIR DATA

Listed below is general information related to the dam and reservoir, which may prove necessary during an emergency situation:

ADWR Dam Name: _____ ADWR Dam Number: _____

ADWR Reservoir Name: _____

Dam Owner and Operator: _____

General Location - Nearest City/Town: _____

Section: _____ Township: _____ Range: _____ G&SR B&M County: _____

Map Location: See Vicinity Map on Following Page

Access Route to Dam: _____

Type of Dam: _____ Purpose of Dam: _____

Dam Height to Spillway Crest: _____ Crest Length: _____ Crest Width: _____

Slope of Upstream Face: _____ Horizontal : 1 Vertical

Slope of Downstream Face: _____ Horizontal : 1 Vertical

Reservoir Volume to Spillway Crest (acre-ft): _____

Year Constructed: _____

Downstream Hazard Potential Classification: _____

Description and Maps of Potential Inundation Areas: See Section 8.0 of this EAP

Outlet Discharge at Maximum Flood Pool (cfs): _____

Spillway Inflow Design Flood (IDF): _____

Spillway Maximum Flow Depth during IDF (ft): _____

Dam Crest Freeboard at Spillway Maximum Flow Depth during IDF (ft): _____

Spillway Maximum Discharge during IDF (cfs): _____

Estimated Dambreak Maximum Discharge (cfs): _____

Warning Systems at Dam: _____

Communication Systems at Dam: _____

Historical Safety Deficiencies at Dam: _____

(INSERT)

VICINITY MAP (FIGURE III)

EXAMPLE: EXCERPT FROM USGS QUADRANGLE MAP SHOWING LOCATION

3.0 PARTICIPANTS RESPONSIBILITIES

3.1 DAM OWNER, OPERATOR, OR DESIGNEE

The dam owner is responsible for maintaining a safe dam, which includes management of operations, periodic inspections, maintenance, repair, and rehabilitation.

3.1.1 Monitoring of the Dam

1. ***During normal operation***, _____ is the person responsible for conducting frequent (minimum monthly) observations of the dam to detect the development of any adverse or unusual conditions, which pose a potential emergency situation. Observations of the dam shall be made more frequently (minimum bi-weekly) when the reservoir is full or near full.

2. ***When a major storm*** develops on the watershed, _____ is the person responsible for closely monitoring (minimum each 12 hours) the dam to detect the development of any adverse or unusual conditions, which pose a potential emergency situation. As a minimum the following shall be monitored and recorded:

    - Clock-time, reservoir elevation, and freeboard to spillway crest and dam crest;
    - Rate the reservoir is rising;
    - Projected maximum reservoir level and whether emergency situation is expected;
    - Discharge conditions of creeks and rivers downstream; and
    - Any indications of adverse or unusual dam conditions.

3. ***When an earthquake*** is reported in the vicinity, or if strong ground motions or damage have been experienced from a large earthquake, _____ is the person responsible to immediately conduct a general overall visual inspection of the dam to detect any adverse or unusual conditions, which pose a potential emergency situation. If no emergency situation is detected, frequent (minimum bi-weekly) inspections of the dam should be made for the following four weeks, as some types of damage may not be revealed immediately after the earthquake.

In the event monitoring of Items 1, 2 or 3 above detects any adverse or unusual conditions which may constitute an emergency situation, as described in Sections 4.0 & 5.0, the monitor will notify the owner listed on the EAP NOTIFICATION LIST, Figure II.

3.1.2 Emergency Situation Response

1. When the owner becomes aware of any adverse or unusual conditions at the dam, the owner will assess the situation per Section 5.0, Emergency Situations, to determine if an ***emergency situation*** exists at the dam.

2. If an **emergency situation** exists, the owner will **classify** the emergency situation per Sections 4.0, Emergency Situation Classification, and immediately **implement** the EAP NOTIFICATION LIST, Figure II. The owner must indicate the **severity and urgency** of the emergency situation to the Sheriff(s) so they may respond appropriately in implementing evacuation or in coordinating monitoring of the situation.

3. The EAP NOTIFICATION LIST includes the names of persons who are responsible for implementing two critical actions (listed below) during an emergency situation. Lost time is avoided by assigning individual persons to implement each task:

   a. Monitor and assess the severity and urgency of the emergency situation at the dam per Section 5.0, Emergency Conditions and report the status of conditions periodically to the Sheriff;

   b. Coordinate with external assistance and implement emergency remedial actions to prevent or minimize the failure of the dam per Section 6.0, Emergency Remedial Actions and 7.0, Emergency Resources.

4. Complete the DAM SAFETY EMERGENCY SITUATION REPORT provided in Appendix IV of this plan following termination of the emergency situation and distribute copies to the Sheriff(s) and ADWR within five (5) days.

3.2 EMERGENCY SERVICES: COUNTY SHERIFF(S) AND EMERGENCY SERVICES AGENCIES AND ORGANIZATIONS

3.2.1 Emergency Situation Response

1. The County Sheriff(s) must **notify** local emergency services agencies and organizations listed on the EAP NOTIFICATION LIST, Figure II, to alert the general public of the severity of the emergency situation and the related urgency. When flooding is not imminent, the Sheriff must coordinate and/or initiate monitoring of the dam. However, when flooding is imminent from failure of the dam or large operational outlet and spillway releases, the Sheriff must immediately **implement** road control and evacuation of persons located within the inundation areas shown on maps(s) provided in Section 8.0 of this EAP.

2. The Local Coordinator for Emergency Management must **notify** and **update** the Arizona Division of Emergency Management when an emergency situation exists:

   Contact: *Operations Section Switchboard @ (602) 244-0504 (M-F 8am-5pm)*

   after duty hours

   Contact: *ADEM Duty Officer Pager @ (602) 238-8482*

4.0 EMERGENCY SITUATION CLASSIFICATION

Emergency situations at the dam are classified based on whether the dam is in imminent or potential risk of failure, as well as whether flooding is likely from operational outlet and spillway releases. Provided below are **three Emergency Classifications** defined for the purpose of this EAP. Section 5.0 describes some examples of adverse or unusual conditions that constitute emergency situations.

4.1 DAM FAILURE IS IMMINENT OR IN PROGRESS

This emergency classification is extremely urgent and is applicable when a dam failure has occurred, is occurring, or obviously is just about to occur and cannot be prevented. No time is available to control the failure of the dam. It is critical that emergency services authorities be immediately notified and made aware of the emergency classification, so they can immediately begin road control and evacuation of the affected public.

4.2 POTENTIAL DAM FAILURE SITUATION IS DEVELOPING

This emergency classification is applicable when it appears a dam failure may eventually occur but there is not an immediate threat of dam failure. Time appears available to obtain external assistance and to evaluate and initiate remedial actions to moderate or prevent failure. The time available to employ remedial actions may be hours, days, or weeks. Emergency services authorities must be notified of this emergency classification, and placed on alert. The Sheriff may initiate independent monitoring of the situation. The dam owner must initiate remedial actions, closely monitor the dam condition, and periodically report the dam condition to emergency services authorities. If the dam condition worsens and failure becomes imminent, emergency services authorities must be immediately notified of the change in the emergency classification to enable evacuation of the affected public.

4.3 FLOODING FROM OUTLET AND SPILLWAY RELEASES

This emergency classification is applicable when operational releases from controlled or uncontrolled outlets, and/or the emergency spillway(s) are expected to exceed (or contribute to stream flows which exceed) the safe capacity of the channel downstream of the dam. Emergency services authorities must be immediately notified of this emergency classification to enable evacuation of the public from the outlet and spillway inundation areas. The condition of the dam must be closely monitored during these major storm events to detect any development of a Potential or Imminent Dam Failure Emergency Situation.

ANY EMERGENCY SITUATION REQUIRES IMPLEMENTATION OF THE EAP NOTIFICATION LIST, FIGURE II

5.0 EXAMPLES OF EMERGENCY SITUATIONS

The following are typical examples, but not necessarily all, adverse or unusual conditions that may occur at a dam and usually constitute an emergency situation. Adverse or unusual conditions that threaten the failure of a dam are typically related to aging or design and construction oversights. However, accidental or intentional damage to the dam may also result in similar conditions. The conditions have been grouped to identify the most likely emergency classification. The groupings are provided as guidance only. Not all emergency conditions may be listed and the owner is urged to use conservative judgement in determining whether a specific condition should be defined as an emergency situation at the dam.

5.1 SEEPAGE AND INTERNAL EROSION OF EMBANKMENT DAM, ABUTMENTS, OR FOUNDATION

5.1.1 Potential Dam Failure Situation is Developing

1. Small amount of cloudy seepage or soil deposits at seepage exit points or from internal drain outlet pipes.
2. New or increased areas of wet or muddy soils are present on the downstream slope, abutment, and/or foundation of the dam, and there is an easily detectable and unusual increase in volume of downstream seepage.
3. Significant new or larger sinkhole(s) or crest settlement.
4. Reservoir level is falling without apparent cause.
5. During an impending or actively occurring storm the following dam defects may become inundated by a rise in the reservoir:
   - Sinkhole(s) located on the upstream slope, crest, abutment, and/or foundation of the dam; and
   - Transverse cracks extending through the dam,abutments, or foundation.

5.1.2 Dam Failure is Imminent or in Progress

1. Rapidly increasing cloudy seepage or soil deposits at seepage exit points to the extent that failure appears imminent or is in progress.
2. Rapid increase in volume of downstream seepage to the extent that failure appears imminent or is in progress.
3. Water flowing out of holes in the downstream slope, abutment, and/or foundation of the dam to the extent that failure appears imminent or is in progress.
4. Whirlpools or other evidence exists indicating that the reservoir is draining rapidly through the dam or foundation.
5. Rapidly enlarging sinkhole(s) are forming on the dam or abutments to the extent that failure appears imminent or is in progress.
6. Rapidly increasing flow through crack(s) eroding materials to the extent that failure appears imminent or is in progress.

5.2 SLIDING, SETTLEMENT, AND CRACKING OF EMBANKMENT DAM, ABUTMENTS, OR FOUNDATION

5.2.1 Potential Dam Failure Situation is Developing

1. Detectable and progressive landsliding or settlement of the crest, slopes, abutments and/or foundation of the dam, which may eventually result in breaching of the dam.
2. Significant increase in length, width, or offset of cracks in the crest, slopes, abutments, and/or foundation of the dam which may eventually result in breaching of the dam.

5.2.2 Dam Failure is Imminent or in Progress

1. Sudden or rapidly proceeding landsliding, settlement, or cracking of the crest, slopes, abutments, and/or foundation, and breaching of the dam appears imminent or is in progress.

5.3 EMBANKMENT DAM SURFACE EROSION

5.3.1 Potential Dam Failure Situation is Developing

1. On-going storm wave erosion over the crest of the dam is reducing the freeboard at one or more locations.
2. On-going storm wave erosion of upstream slope at the crest of the dam is reducing the crest width at one or more locations
3. On-going spillway discharge or surface runoff is significantly eroding the embankment.

5.3.2 Dam Failure is Imminent or in Progress

1. Storm wave erosion over the crest of the dam has reduced or is rapidly reducing the freeboard at one or more locations to the extent that breaching of the dam appears imminent or is in progress.
2. Storm wave erosion of upstream slope at the crest of the dam has reduced or is rapidly reducing the crest width at one or more locations to the extent that breaching of the dam appears imminent or is in progress.
3. Spillway discharge or surface runoff has severely eroded or is rapidly eroding the embankment to the extent that breaching of the dam appears imminent or is in progress.

5.4 SLIDING, SETTLEMENT, CRACKING, AND EROSION OF CONCRETE DAM, ABUTMENTS, OR FOUNDATION

5.4.1 Potential Dam Failure Situation is Developing

1. Sliding or settlement of bedrock abutment or extensive cracking of the concrete dam, which does not appear to threaten an imminent failure of the dam.
2. On-going overtopping of a concrete dam or high concrete overflow spillway section is resulting in erosion of the bedrock abutment or foundation but the rate does not appear to threaten an imminent breach of the reservoir.

5.4.2 Dam Failure is Imminent or in Progress

1. Sliding or settlement of bedrock abutment or extensive cracking and sliding of the concrete dam appears to threaten an imminent failure of the dam.
2. On-going overtopping of a concrete dam or high concrete overflow spillway section is rapidly eroding the bedrock abutment or foundation and breaching of the reservoir appears imminent.

5.5 EMBANKMENT DAM OVERTOPPING BY FLOOD WATERS

5.5.1 Potential Dam Failure Situation is Developing

1. The reservoir level reaches within three (3) feet of the crest of dam and is projected to continue to rise.
2. Based on the anticipated runoff from an arriving major storm, the reservoir level is projected to rise within three (3) feet of the crest of dam.
3. The spillway or outlet works is plugged and the reservoir level is projected to rise within three (3) feet of the crest of dam.

5.5.2 Dam Failure is Imminent or in Progress

1. The reservoir level reaches within eighteen (18) inches of the top of dam and is projected to continue to rise, or at any time the reservoir level is projected to rise above the crest of the dam.
2. Based on anticipated runoff from an arriving major storm, the reservoir level is projected to rise above the crest of dam.
3. The spillway is plugged and the reservoir level is projected to rise above the crest of dam.

5.6 CONCRETE DAM OVERTOPPING BY FLOOD WATERS

5.6.1 Potential Dam Failure Situation is Developing

1. The depth of flow over the crest of the dam exceeds _____ feet and is projected to continue to rise.
2. Based on the anticipated runoff from an arriving major storm, the depth of flow over the crest of the dam is projected to exceed _____ feet.
3. The spillway or outlet works is plugged and the depth of flow over the crest of the dam is projected to exceed _____ feet.

5.6.2 Dam Failure is Imminent or in Progress

1. The depth of flow over the crest of the dam exceeds _____ feet and is projected to continue to rise.
2. Based on the anticipated runoff from an arriving major storm, the depth of flow over the crest of the dam is projected to exceed _____ feet.
3. The spillway or outlet works is plugged and the depth of flow over the crest of the dam is projected to exceed _____ feet.

5.7 FLOODING FROM OUTLET AND SPILLWAY RELEASES

Water released from operating dam outlets and spillways is often confined in defined floodway channels and thus, there is not a threat of the public being flooded. Any operational releases of water from a dam meeting the definitions below are classified as an **Emergency Situation** due to **FLOODING FROM OUTLET AND SPILLWAY RELEASES.**

The condition of the dam must be monitored closely to detect any development of a **Potential or Imminent Dam Failure Emergency Situation**.

5.7.1 Flooding from Outlet Releases

1. Unusually large operational releases from controlled or uncontrolled outlets are expected to exceed (or contribute to stream flows which exceed) the safe capacity of the channel downstream of the dam.

5.7.2 Flooding from Spillway Releases

1. Unusually large operational releases from controlled or uncontrolled spillways are expected to exceed (or contribute to stream flows that exceed) the safe capacity of the channel downstream of the dam defined below for the type of dam (check one that applies):

- ❑ Permanent Pool Dam: When the reservoir level rises to, or is projected to rise to a flood depth of twelve (12) inches or greater in the emergency spillway.
- ❑ Flood Control Dam: When the reservoir level rises to, or is projected to rise above the crest of the emergency spillway.

5.8 OTHER CONDITIONS

5.8.1 Potential Dam Failure Situation is Developing

1. **One or more landslides** are slowly progressing in the reservoir area and the reservoir has a relatively full pool.
2. **Appurtenant concrete structures**, such as the spillway or outlet works, show increasing seepage or new cracks and offsets that may lead to major structural damage due to high water levels or inundation during the arriving major storm.
3. **Significant erosion or head-cutting of the spillway** is occurring but the rate does not appear to threaten an imminent breach of the reservoir.
4. _____
5. _____
6. _____

5.8.2 Dam Failure is Imminent or in Progress

1. **One or more large landslides** are rapidly proceeding into the reservoir area are expected to cause the dam to overtop, eroding and breaching the reservoir.

2. **Appurtenant concrete structures**, such as the spillway or outlet works, show rapid or large increases is seepage or significant new cracks and offsets that will result in major structural damage due to high water levels or inundation during the arriving major storm, and failure of the dam appears imminent.
3. **Significant erosion or head-cutting of the spillway** is occurring at a rapid rate and a breach of the reservoir appears imminent.
4. _____
5. _____
6. _____

5.9 ABNORMAL INSTRUMENTATION READINGS

If any of the following threshold values are exceeded, an adverse or unusual condition exists at the dam and an emergency situation classified as a **Potential Dam Failure Situation is Developing** should be declared.

Threshold values should generally be assigned to typical instrumentation such as reservoir level gauge, crest survey monuments, seepage monitoring devices, and piezometers.

- A guide for the **reservoir level** may be an unexpected drop in the reservoir of two feet or more.
- A guide for **survey monuments** may be 6-inches vertical or horizontal per year.
- A guide for increased or decreased **seepage quantities** from internal drain systems may be fifty percent (50%) of “normal” flows previously established for the existing season and/or reservoir level.
- A guide for **piezometers** may be the maximum elevation of the phreatic surface used in the slope stability analyses.

Instrument Type and ID	Critical Value

6.0 EMERGENCY REMEDIAL ACTIONS

6.1 EMERGENCY REMEDIAL ACTIONS WHICH IMPAIR THE SAFETY OF THE DAM

Any action which impairs the safety of the dam, even when failure is imminent, requires prior approval of the ADWR Dam Safety Section:

An owner shall not excavate into or near the crest or toe of the dam embankment or spillway control section to lower the water, or plug the spillway to retain water. These actions will impair the safety of the dam and can only be initiated if failure is imminent and the owner follows a plan approved by ADWR. A plan, including equipment, supplies and type of breach, is required to provide the greatest probability the planned failure will be controlled to within safe limits. Time permitting, any remedial action should be developed through consultation with a professional engineer with knowledge of dam technology.

6.2 EMERGENCY REMEDIAL ACTIONS WHICH DO NOT IMPAIR THE SAFETY OF THE DAM

Any action which does not impair the safety of the dam may be taken immediately.

Emergency remedial actions are described for typical adverse or unusual conditions, which result in an emergency situation at the dam. The emergency remedial actions described below do not require prior approval of ADWR. Immediate implementation of these remedial actions may delay, moderate, or prevent the failure of the dam after an emergency situation is first discovered. Several of the listed adverse or unusual conditions may be apparent at the dam at the same time, requiring implementation of several modes of remedial actions. Close monitoring of the dam must be maintained to confirm the success of any remedial action taken at the dam. Time permitting, any remedial action should be developed through consultation with a professional engineer with knowledge of dam technology.

6.2.1 Actions for Overtopping by Flood Waters

1. Open outlet(s) to maximum capacity to lower the reservoir as rapidly as possible to a safe level.
2. Place sandbags along the dam crest to increase freeboard, thereby safely directing more water through the spillway(s) and outlet(s).
3. Cover the dam crest and downstream slope with riprap, sandbags, plastic sheets, or other materials to provide erosion-resistant protection.
4. Construct berms and/or channels, if possible, to divert floodwaters around the reservoir basin.

6.2.2 Actions for Reduction in Freeboard and/or Loss of Dam Crest Width Due to Storm Wave Erosion

1. Place additional riprap, sandbags, or other materials in damaged areas to prevent or minimize further embankment erosion.
2. Open outlet(s) to maximum capacity to lower the reservoir level as rapidly as possible to below the damaged area.
3. Place sandbags or earth and rockfill materials in the damaged area to restore freeboard.

6.2.3 Actions for Sliding or Slumping on the Upstream or Downstream Slope of the Embankment

1. Open outlet(s) and lower the reservoir to a safe level at a rate commensurate with the urgency and severity of the condition of the slide or slump. If the outlet is damaged or blocked, pumping or siphoning may be required.
2. Repair settlement of the crest by placing sandbags or earth and rockfill materials in the damaged area to restore freeboard.
3. Stabilize slides on the downstream slope by placing a soil or rockfill buttress against the toe area of the slide.

6.2.4 Actions for Seepage Producing Internal Erosion (Piping) of the Embankment, Foundation, or Abutments

1. Open outlet(s) to maximum capacity to lower the reservoir level as rapidly as possible to a level that stops or decreases the seepage to a non-erosive velocity. Continue lowering the water level at a safe drawdown rate until the seepage stops.
2. If the entrance to the seepage origination point is observed in the reservoir (possible whirlpool), reduce the flow by plugging the entrance with readily available materials, including hay bales, bentonite, soil or rockfill, or plastic sheeting.
3. Cover the seepage exit area(s) with several feet of sand/gravel to hold fine-grained embankment or foundation materials in place. Alternatively, construct sandbag or other types of ring dikes around seepage exit areas to retain a pool of water, back-pressuring and reducing the erosive nature of the seepage.
4. Prevent vehicles and equipment from driving between the seepage exit points and the embankment to avoid potential loss from the collapse of an underground void.

6.2.5 Actions for Failure of an Appurtenant Structure such as an Outlet or Spillway

1. Implement temporary measures to protect the damaged structure, such as closing an outlet or providing temporary erosion protection for a damaged spillway.
2. Employ experienced, professional divers, if necessary, to assess the problem and possibly implement repair.
3. Open outlet(s), when safe, and lower the reservoir level at a rate commensurate with the severity and urgency of the condition to a safe level. If the outlet is inoperable, pumping or siphoning may be required.

6.2.6 Actions for Mass Movement of the Dam on its Foundation (Spreading or Mass Sliding Failure)

1. Open outlet(s) to maximum capacity to lower the reservoir as rapidly as possible to a level where excessive movement stops. Continue lowering the reservoir at a safe

drawdown rate to a level providing adequate safety against potential additional mass sliding.
2. Stabilize sliding in the downstream direction by placing a soil or rockfill buttress on and/or against the toe area of the slide.
3. Repair settlement of the crest or separation at the abutments by placing sandbags or earth and rockfill materials in the damaged area(s).

6.2.7 Actions for Excessive Seepage and/or High Level Saturation of the Embankment

1. Open outlet(s) and lower the reservoir at a rate commensurate with the severity and urgency of the condition until the seepage stops, seepage is reduced to a safe rate, or piezometer levels are lowered to a level which provides adequate safety for slope stability.

6.2.8 Actions for Spillway Erosion Threatening Breach of the Reservoir

1. Open the outlet(s) to maximum capacity to reduce the flow over the spillway, and as the inflow reduces, continue to lower the reservoir at a safe drawdown rate to a safe level.
2. Provide protection at the point of erosion by placing sandbags, rip rap, soil or rockfill, or plastic sheets weighted with sandbags.

6.2.9 Actions for Foundation or Abutment Erosion due to Overtopping of a Concrete Dam or HIgh Concrete Overflow Spillway Section

1. Open outlet(s) to maximum capacity and lower the reservoir as rapidly as possible to reduce overtopping flows and foundation erosion. Continue to lower the reservoir to eliminate overtopping and provide adequate safety for stability of the dam.
2. Place large riprap or other materials in the damaged areas to prevent or minimize further erosion.

6.2.10 Actions for Loss of Abutment Support or Extensive Cracking in Concrete Dams

1. Open outlet(s) to maximum capacity to lower the reservoir as rapidly as possible to a safe level.
2. Attempt to block water movement through the dam by placing plastic sheets on the upstream face.

6.2.11 Actions for Abnormal Instrumentation Readings

1. Conduct immediate detailed inspection of the dam and surrounding area for any unusual or adverse conditions.
2. Review abnormal instrumentation readings to evaluate whether any unusual adverse conditions are occurring internal to the dam, abutments, foundation, or reservoir.
3. Open outlet(s) and lower the reservoir at a safe draw-down rate to a safe level.

7.0 EMERGENCY RESOURCES

In an emergency situation, equipment, supplies and construction personnel will likely be needed on short notice. The table below lists general emergency resources, and also Indicates how to access them.

Item	Contact/Telephone	Location
Earthmoving Equipment:		
General		
Bulldozers		
Excavators		
Sand and Gravel		
Sandbags		
Pumps		
Pipe		
Laborers		
Engineering Services[1]		

[1]Professional Engineer with knowledge of dam technology

8.0 INUNDATION AREA(S) TO BE EVACUATED

8.1 DESCRIPTION OF INUNDATED AREA(S)

8.1.1 Outlet and Spillway Releases

1. Evacuation Areas: See designated areas on Inundation Map in Section 8.2
   (Evacuation areas should be prioritized to correspond to level of danger and evacuation resources)
2. Estimated No. of Habitations to Evacuate: _____
3. Stream Name: _____
4. General Description: _____

8.1.2 Dam Break Releases

1. Evacuation Areas: See designated areas on Inundation Map in Section 8.2
   (Evacuation areas should be prioritized to correspond to level of danger and evacuation resources)
2. Estimated No. of Habitations to Evacuate: _____
3. Stream Name: _____
4. General Description: _____

8.2 MAPS OF INUNDATED AREA(S)

Inundation Map(s) Follow

8.2.1 OUTLET & SPILLWAY RELEASES INUNDATION MAP

(INSERT SITE SPECIFIC MAP – 8½" X 11" MINIMUM)

8.2.2 DAM BREAK RELEASES INUNDATION MAP

(INSERT SITE SPECIFIC MAP – 8½" X 11" MINIMUM)

APPENDIX I
EAP APPROVAL PAGE

The undersigned persons have reviewed this Emergency Action Plan and concur with the proposed responsibilities and procedures.

ORGANIZATION SIGNATURE & DATE

_____ _____ Date_____

Printed Name and Title: _____

_____ _____ Date_____

Printed Name and Title: _____

_____ _____ Date_____

Printed Name and Title: _____

_____ _____ Date_____

Printed Name and Title: _____

_____ _____ Date_____

Printed Name and Title: _____

_____ _____ Date_____

Printed Name and Title: _____

_____ _____ Date_____

Printed Name and Title: _____

_____ _____ Date_____

Printed Name and Title: _____

_____ _____ Date_____

Printed Name and Title: _____

APPENDIX II
EAP UPDATING AND MOCK EXERCISES

1. **EAP UPDATING:** _____ is responsible for reviewing the current EAP annually. This person is also responsible for providing revisions to the record copy holders when major changes have occurred. Major changes include the following:

   - Changes in assignments of personnel or telephone numbers.
   - Changes in Equipment and Supplies information.
   - Changes made to the dam.
   - Changes in the flood inundation areas, downstream developments, or in the reservoir.
   - Other items as applicable.

2. **EAP MOCK EXERCISES:** _____ is responsible for initiating mock exercises of this EAP each _____ year(s). The EAP shall be revised to incorporate information learned from the mock exercises. Mock exercises may vary from only telephone notification per Figure II, EAP NOTIFICATION LIST, to both notification and site response, as agreed upon by the emergencies services agencies and organizations involved in each exercise.

APPENDIX III
EAP DISTRIBUTION

This section lists which owner(s), agencies and entities have record copies of this EAP. Provide all updates to each record copy holder. Make a complete copy of the EAP available to all dam tenders, emergency service agencies and entities, and appropriate local officials.

POST: Post copies of the **EAP IMPLEMENTATION FLOWCHART** and the **EAP NOTIFICATION LIST** at appropriate locations, including the dam, at the operator's office or residence, and the owner's office or residence.

EAP DISTRIBUTION

Contact/Agency	Responsible Person/Title	Telephone/Address
1.		
2.		
3.		
4.		
5.		
6.		
7.		
8.		
9. Arizona Division of Emergency Management	Mathew A. Parks, Hazard Identification and Risk Assessment	(602) 392-7510 5636 E. McDowell Road Phoenix, AZ 85008
10. Arizona Department of Water Resources	J. Darrell Jordan, Manager, Office of Water Engineering	(602) 417-2445 500 N. Third Street Phoenix, AZ 85004

APPENDIX IV
DAM SAFETY EMERGENCY SITUATION REPORT

(Photocopy and fill-out after termination of Emergency Situation. Complete ALL sections that are applicable to the situation. Distribute copies to Sheriff(s) and ADWR with five (5) days.)

Dam Name: _____ ADWR Dam Number: _____

Dam Location: _____
(City) (County) (Stream/River)

Date: _____ Time: _____

Weather Conditions: _____

General Description of Emergency Situation: _____

Area(s) of Dam Affected: _____

Extent of Dam Damage: _____

Possible Cause(s): _____

Effect on dam's operation: _____

Effect on operational capabilities of outlet works: _____

Initial Reservoir Elevation: _____ Time: _____

Maximum Reservoir Elevation: _____ Time: _____

Final Reservoir Elevation: _____ Time: _____

Description of area flooded downstream/damages/injuries/loss of life: _____

Other Data and Comments: _____

Observer's name and telephone number: _____